ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

DATE: February 1999

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603004A Weapons and Munitions Advanced Technology

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	23694	24858	39893	38686	24288	30862	39214	51920	Continuing	Continuing
DL94 Electric Gun Systems Demonstration	0	0	0	0	0	2064	2517	14607	Continuing	Continuing
D43A Advanced Weaponry Technology Demonstration	7821	13345	25685	21982	11297	13612	20227	20575	Continuing	Continuing
D232 Advanced Munitions Demonstration	10252	11513	14208	16704	12991	15186	16470	16738	Continuing	Continuing
D233 Trajectory Correctable Munitions Development	5621	0	0	0	0	0	0	0	0	5621

A. Mission Description and Budget Item Justification: The objective of this Program Element (PE) is to demonstrate affordable, advanced weapons and munitions technologies that will increase battlefield lethality and survivability. Part of this PE funds several stand-off weapons demonstrations and sensors within the Rapid Force Projection Initiative (RFPI) Advanced Concept Technology Demonstration (ACTD), (field exercise in fourth quarter FY 1998 and extended user evaluation in FY 1999-2000), structured to significantly increase the capability of Early Entry Forces. The RFPI demonstrations funded within this PE include the Integrated Acoustic Sensor (IAS) and more responsive digitized fire control for a towed 155mm automated howitzer. An initiative in response to recent threat information, especially against new explosive reactive armors (which appear as appliqués), is the Direct Fire Lethality program, the purpose of which is to significantly enhance Abrams tank anti-armor lethality in terms of hit and kill by maximizing warhead/penetrator effectiveness and significantly increase tank gun accuracy under dynamic battlefield conditions. In the area of combat vehicle anti-armor munitions, advanced explosively formed penetrator warheads exploit technologies in explosives, liner materials and modeling, and demonstrate increased armor penetration through advanced warhead concepts. Work in this program element is consistent with Army Vision 2010, Army After Next, the Army Science and Technology Master Plan, the Army Modernization Plan, and Project Reliance. This program is primarily managed by the U.S. Army Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ. This program adheres to Tri-Service Reliance Agreements on conventional air-surface weaponry with oversight provided by the Joint Directors of Laboratories. Work in this PE is related to and fully coordinated with efforts in PE 0602624A (Weapons and Munitions Technology), PE 0602618A (Ballistics Tech) and PE 0604802A (Weapons and Munitions – Engineering Development).

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B. Program Change Summary	FY 1998	FY 1999	FY 2000	FY 2001
Previous President's Budget (FY 1999 PB)	25444	24555	42076	35558
Appropriated Value	26255	25055		
Adjustments to Appropriated Value				
a. Congressional General Reductions	-811	-197		
b. SBIR / STTR	-602			
c. Omnibus or Other Above Threshold Reductions	-198			
d. Below Threshold Reprogramming	-950			
e. Rescissions				
Adjustments to Budget Years Since FY 1999 PB			-2183	+3128
Current Budget Submit (FY 2000 / 2001 PB)	23694	24858	39893	38686

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PROJECT: D43A

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D43A Advanced Weaponry Technology Demonstration	7821	13345	25685	21982	11297	13612	20227	20575	Continuing	Continuing

Mission Description and Justification: This project includes the non-missile stand-off weapons and advanced concepts for the Rapid Force Projection Initiative (RFPI) Advanced Concept Technology Demonstration (ACTD), lethality enhancements under the Direct Fire Lethality Program, and other light forces weapon enhancements, like the Precision Guided Mortar Munition (PGMM). The PGMM demonstration will feature an affordable laser guided mortar munition with an extended range glide capability that will double mortar range capabilities and dramatically improve mortar accuracy. Weapon demonstrations are vital to assessing new tactics and technologies for early entry forces. Towed howitzer fire control enhancements applicable to both Army and Marine Corps artillery requirements are included under the RFPI ACTD. A key RFPI ACTD Integrated Acoustic Sensor (IAS) system will be evaluated. Smart munition sensor technologies capable of locating targets in clutter applicable to next generation smart munitions will also be evaluated. Most of these concepts being demonstrated are candidates for technology insertions and most provide significant enhancement to early entry forces. FY 2000 and FY2001 funding will support the area denial technology demonstration scheduled for FY 2001. In-house efforts are accomplished by the Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ and the U.S. Army Research Laboratory (ARL), Aberdeen Proving Ground, MD. Major contractors include: Alliant Tech Systems, Minneapolis, MN; Science Applications International Corp. (SAIC), McLean, VA; LTV Aerospace, Dallas, TX; Textron, Lowell, MA; Ferrulmatic, Inc., Totowa, NJ; Talley Defense, Mesa, AZ; Parker Kinetics Design, Austin, TX; Nomura Enterprise, Rock Island, IL; Loral, Dallas, TX; Olin-Flinchbaugh, Red Lion, PA; Textron, Inc., Willington, MA; Technical Solutions Incorporated (TSI), Mesina Park, NM; Motorola, Scottsdale, AZ; Lockheed Martin, Orlando, FL; MEI Technology, Lexington, MA; Computing Device International, Minneapolis, MN; Singer Kearfott, Wayne, NJ; Diehl GmbH., Rothenbach, Germany.

FY 1998 Accomplishments:

- 5160 - Completed PGMM advanced technology demonstration (ATD) seeker captive flight testing.
  - Conducted PGMM fin deployment and launch environment fire tests.
- 2661 - Completed testing of towed howitzer fire control for safety release.
  - Developed tactics, techniques and procedures for the 155mm automated howitzer.
  - Upgraded one battery with digitized fire control system; conducted RFPI field experiment.
  - Completed evaluation of the RFPI IAS system.

Total 7821

FY 1999 Planned Program:

- 4849 - Conduct PGMM wing deployment live fire tests; conduct laser sensor trade studies; participate in the Military Operations in Urban Terrain (MOUT) ACTD via simulation.

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FY 1999 Planned Program: (continued)

- 808 - Support automated towed howitzer extended user evaluation under the RFPI ACTD.
- 2438 - Fabricate hardware for electro-rheological fluid recoil system testbed 2 for the Advanced Technology Lightweight Artillery System (ATLAS).
- 1463 - Complete integrated design of dual novel penetrator system for defeat of future armor targets with less than 5 megajoules of energy on target.
  - Demonstrate optical fiber muzzle reference sensor capability to continuously measure gun tube flexure.
- 3560 - Conduct fire control system definition for launching extended range munitions.
  - Complete detailed system designs.
  - Downselect to one or two designs for demonstration phase.
- 227 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs

Total 13345

FY 2000 Planned Program:

- 10057 - Conduct sub-system demonstrations of Tank Extended Range Munition (TERM) using simulation and live-fire, and refine the concept.
  - Complete guide-to-hit demonstration for TERM.
- 6108 - Conduct PGMM ATD range and stability demonstration fires; conduct PGMM Global Positioning System (GPS) evaluation.
  - Conduct simulation and modeling effort for area denial; procure and test prototype weapon system and sensor hardware.
- 7402 - Complete automated towed howitzer extended user evaluation under the RFPI ACTD.
  - Define combined laser detection and ranging (LADAR), millimeter wave radar and infrared sensor suite requirements to detect low observable targets; conduct captive flight test to evaluate WBAND (94 gigahertz) millimeter wave radar and LADAR sensor suite for next generation smart munition applications.
  - Conduct ATLAS live fire demonstration of 6750 lb. weapon; begin fabrication of 5700 lb. weapon.
- 2118 - Conduct integrated demonstrations of novel dual penetrator systems to establish enhanced defeat of complex armor with less than 5 megajoules of energy on target.

Total 25685

FY 2001 Planned Program:

- 3349 - Demonstrate capability of hitting stationary and moving targets with TERM.
  - Demonstrate defeat of advanced threat armors and active protection systems through simulation and/or live fire.
- 4896 - Conduct demonstrations of advanced turret with precision stabilization in live-fire demonstrations.
  - Complete dual role ammunition and gearless turret development.

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- 3764 - Conduct PGMM ATD laser round demonstration firings.
  - Build and test area denial hardware and conduct system demonstration.

FY 2001 Planned Program: (continued)

- 4973 - Perform operational evaluation of 5700 lb. ATLAS weapon.
- 5000 - Develop aiming algorithm to support real time processing in a captive flight test (CFT) for LADAR/infrared/millimeter wave sensor suite
  - Conduct CFT to validate detection capability against low observable targets.

Total 21982

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BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603004A Weapons and Munitions Advanced Technology

PROJECT: D232

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D232 Advanced Munitions Demonstration	10252	11513	14208	16704	12991	15186	16470	16738	Continuing	Continuing

Mission Description and Justification: This project includes the Direct Fire Lethality (DFL) program which will enhance tank kinetic energy (KE) penetrator lethality, particularly against explosively reactive armor (ERA) appliqué arrays now available on fielded threat systems, through use of a precursor defeat mechanism. The program will demonstrate range and lethality enhancements for tank munitions and demonstrate the emerging technologies needed to defeat the active protection system (APS) threat. In the near term, this project demonstrates advanced warhead and cartridge concepts, utilizing novel explosively formed penetrators (EFP) and shaped charged designs, that can be applied to product improvements to fielded and developmental anti-armor munitions, (e.g., autonomous intelligent submunition (AIS) Damocles, wide area munitions (WAM), smart target activated fire and forget (STAFF), 120mm chemical energy (CE) cartridge and the Sense and Destroy Armor (SADARM) submunition. It advances warhead technology to enhance the lethality of smart projectiles by providing multi-role, multi-effect warheads capable of defeating point and area targets. This project will fund demonstrations of advanced fuzes for near term munitions concepts. Low Cost Competent Munition (LCCM) concepts integrating global positioning system (GPS) into fuzing are being developed for artillery projectiles. The resulting screw-on module and ground receiver will significantly increase a projectile's overall delivery accuracy and also be readily applicable to the existing stockpile of 155mm artillery projectiles. In-house efforts are accomplished by Armament Research Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ and the U.S. Army Research Laboratory (ARL), Aberdeen Proving Ground, MD. Major contractors include: Alliant Tech Systems, Minneapolis, MN; Science Applications International Corp. (SAIC), McLean, VA; LTV Aerospace, Dallas, TX; Textron Defense Systems, Wilmington, MA; Ferrulmatic, Inc., Totowa, NJ; Talley Defense, Mesa, AZ; Parker Kinetics Design, Austin, TX; Nomura Enterprise, Rock Island, IL; Loral, Dallas, TX; and Olin-Flinchbaugh, Red Lion, PA.

FY 1998 Accomplishments:

- 4550 - Completed DFL ATD precursor integrated concept demonstrations.
  - Downselected precursor technology to achieve optimum defeat capability of ERA targets.
  - Demonstrated feasibility to improve flight dynamics of KE penetrators to achieve 70% probability of hit improvement at 3 kilometers and performed armor tests for 120mm tank ammunition.
- 1126 - Evaluated extended range munitions concepts and developed detailed system designs.
- 4115 - Completed full-up real time system demonstration of LCCM auto-registration system; developed hardware and software interfaces with Paladin, M198 and M109A5 self-propelled howitzer platforms; developed fire control system hardware and software changes to accommodate auto-registration system.
  - Demonstrated Integrated Acoustic System (IAS) for the Rapid Force Projection Initiative (RFPI), a target detection system to support early entry forces' "stand off killer" concepts.
- 461 - Competitively bought long stand-off warhead candidate for Government testing in FY 1999.

Total 10252

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FY 1999 Planned Program:

•	5114	- Complete DFL ATD precursor penetrator integrated cartridge design. - Conduct technology maturation demonstrations for optimum novel penetrator function and armor penetration utilizing tactical composite sabot and propulsion system.
•	3419	- Complete extended range munitions design, downselect, and conduct critical subsystem demonstrations.
•	2754	- Conduct tests of downselected warheads from FY 1998 and develop as candidate for counter active protection system.
•	226	- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs
Total	11513	

FY 2000 Planned Program:

•	6500	- Complete integrated cartridge design of advanced kinetic energy (KE) cartridge for the Abrams tank capable of defeat of explosive reactive armor.
•	7708	- Demonstrate guide-to-hit munitions for Tank Extended Range Munition (TERM).
Total	14208	

FY 2001 Planned Program:

•	10204	- Demonstrate fire control sub-system for TERM.
•	6500	- Complete demonstration of KE defeat of explosive reactive armor.
Total	16704	

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PROJECT: D233

COST (*In Thousands*)	FY1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
D233 Trajectory Correctable Munitions Development	5621	0	0	0	0	0	0	0	0	5621

Mission Description and Justification: This project funds a Congressionally mandated trajectory correctable munition (TCM) program called the XM982 Extended Range Artillery projectile. This munition will provide the Army with a versatile projectile with unprecedented range and accuracy and will significantly extend the capabilities of both current and developmental 155mm artillery platforms. Program management is conducted by the Project Manager for Sense and Destroy Armor (SADARM) and in house efforts are primarily conducted by the Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ.

FY 1998 Accomplishments:

- 621 - Provided government support for engineering, integrated product team (IPT), and source selection efforts for the XM982 engineering, and manufacturing development (EMD) contract.
- 5000 - Completed preliminary design and testing of XM982 dual-purpose improved conventional munitions (DPICM) extended range projectile, payload, instrumentation and guidance systems.

Total 5621

FY 1999 Planned Program: This project is not funded in FY 1999.

FY 2000 Planned Program: This project is not funded in FY 2000.

FY 2001 Planned Program: This project is not funded in FY 2001.